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ABSTRACT

The attention given to distance education in high schools, universities, and corporations has been increasing due to cost and time effectiveness for the learner. This paper identifies a framework for teaching science using distance education. Interactive television, which is a two-way communication device, allows student and presenter to interact in real-time at a distance. A tracking option is available for the facilitator to track the time students spend on each task. Distance education is used as an instructional tool, which is an important and cost-effective teaching method that creates a meaningful learning environment. (Contains 14 references.) (YDS)

An Interactive Discussion of Distance Learning Technologies and Methods

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An Interactive Discussion of Distance Learning Technologies and Methods

Purpose

Distance learing is becoming the paramount of educational focus from many universities, high schools and corporations. This is due in part to the fact that it is cost effective for institutions and time effective for the learner. The use of video enhances the visual learner's capacity to assimilate new content (Dunston, 1992; Hannafin, 1996). Digital learning is critical if we are dedicated to preparing students with the necessary technology and critical thinking skills (Forum, 2000, June). Jackson (Jackson, 1998) said, "Computers are only a tool to assist learning; useful in the hands of a skilled artisan, the teacher, otherwise functioning as an expensive desk ornament."

Science has been argued as the most difficult topic to teach from a distance. As many science educators are being coerced to develop online/distance courses, this presentation will assist in where to begin and what to expect along the way of changing from the science classroom to cyber-science. Teachers need to constantly modify both their content knowledge and pedagogical skills to meet the needs of the increasingly diverse populations of students in schools today and the integration of standards (Watson, 1992).

Methods of distance learning that will be discussed beyond the live 2-way mode are video presentations with live wrap-around discussion and an asynchronous mode using streamed video taken from a live presentation. By definition of this project, interactive television is a two-way communication medium that allows the presenter and student to be at a distance, yet they are able to see and hear each other in real-time. Wrap-

around discussion sessions are tape delayed sessions of a presenter. These are broadcast over the same channels as interactive television with the discussion being facilitated by a mediator. Finally asynchronous (web-based) instruction, the most fundamental definition of distance education, is a form of education in which students are separated from their instructor by time and/or space.

Legislation has aided in the realm of education from a distance through laws such as the "No Child Left Behind Act of 2001" and the e-rate initiative. On January 8, 2002 the current president of the United States, George W. Bush, signed into law the Elementary and Secondary Education Act (ESEA), also known as the "No Child Left Behind Act of 2001", with hopes to ensure educational quality through standards-based curricula. The U.S. Department of Education will guide and regulate the structure of ESEA for standards, assessment and school improvement. More than $700 million is available in 2002 for schools to enhance education through technology. Also, that federal funding only goes to programs that are backed by researched evidence.

With the passing of the 1996 Telecommunications Act, the e-rate initiative came about. The e-rate initiative is a major component of this act. It provides schools and libraries with discounts ranging from 20-90 percent for establishing Internet and telecommunication infrastructures. Overseen by the Federal Communications Commission (FCC) and contracted through a nonprofit group called the Universal Service Administration Company (USAC), currently 86 percent of public schools, 21 percent of private schools and 65 percent of libraries have received discounts (Sarkar, 2003). Therefore, any successful effort at school reform and restructuring must include an adequate amount of information technologies.

Setting for Live and Videotape Sessions

For each of the sessions of interactive television and videotape with wrap around discussion respectively, teachers met in small groups in media rooms within their rural school district. These rooms are comprised of television monitors so they can see either the remote presenter or the other groups involved in the instructional session with them (teacher monitor). Another television monitor shows teacher's room so they can adjust to their outgoing video (student monitor). In addition, an overhead camera hangs from the front of the room for a presenter to use, and there also is a student camera that moves automatically to the person speaking in the room. Participants and instructors may choose to use either a tabletop microphone with a push bar (cantilever) or a lavaliere microphone, which is attached to a lapel or similar article of clothing (Appendix A).

Live, 2-way interaction and Videotape Sessions

In this professional development project, these 2 modes of communication were very similar with one significant difference; the lack of a live presenter to answer specific questions during the videotaped sessions. The videotaped sessions were taken from live sessions that were broadcast the previous week. Although videotaped, they were still aired over the same network that the live, 2-way sessions were broadcast. Within these sessions, the teachers viewed a presentation, and then were facilitated through a discussion with the other sites about what types of questions they have had from the presentation. Teachers also discussed ways that they might be able to integrate what they learned into their classrooms. Finally, they viewed the discussion on the tape and reformulated a list of questions because some of the questions might be common to what they viewed on the videotape. Specific questions were either emailed to the presenter or

those same questions were posted on the project website[1]. Answers to the questions were again posted on the website and emailed to all participants in that videotaped session.

Where to begin

It is important to note that the process of setting up a distance education environment is a time intensive process. Through this professional development project the recruitment of quality presenters began almost 6 months before the first presentation was to broadcast. It has been argued that the only effective distance education is achieved by having the presenter be a leader in his field. Attracting the presenters who were leaders in their field or who are doing cutting-edge research is not an easy task and thus the prior planning.

Getting a support system in place for the participants is another important consideration before commencing a course from a distance. We have found that when using multiple sites, it is critical to have a facilitator at each site along with a facilitator at the origination site to filter questions. If there are too many or too few participants involved at any one time, the frustration level of the participants rises considerably. Many participants in conferencing have expressed frustration and disappointment with the difficulty they have had in sorting out relevant from irrelevant information, because there are so many participants contributing messages on a variety of different topics (Romiszowski, 1996). Cheng and Reynolds (Cheng, 1991) express concern for these instructors as well. It is often too time-consuming to provide occasion for every student to join discussion-except where everyone's input is critical.

[1] www.umsl.edu/~scicoop

Along with a support system, there needs to be an outline that supports both large group and small group discussion, activities and question/answer periods. The format followed in this project was one that encompassed 2-hour blocks. Sessions followed a structure of an approximately 30-minute presentation, followed by 10 minutes of on-site collaboration of teachers in small groups to generate specific questions for the presenter. After facilitating through each site and having the presenter answer those questions, the small groups again met for 10 minutes to share ideas of incorporating the new knowledge into their classrooms. These ideas are finally shared with the entire group involved in that session.

Finally, prior planning and foresight is a critical component for a successful presentation. If hands-on activities are part of the presenter's lesson, it is important that all of the sites have the manipulative available well in advance of the scheduled date.

Possible Impediments

The use of video over ISDN or fiber optics lines lends itself to an array of potential problems. Issues of getting knocked off-line during a presentation, losing audio but having video, losing video while having audio or simply the inability to connect to the bridge that connects all of the sites are just a few road blocks encountered. Moreover, the use of codecs (compression-decompression) on video and audio need to be established early to be sure there is compatibility.

Although facilitators are in place, classroom management has been a slight problem for the presenters who weren't firm in their delivery or in following the format of the session. Attendance also was a slight problem that was quickly rectified once the participants understood their grade/incentives depended on their attendance.

The presenters themselves were, at times, problem areas. In some instances they did not live up to the level of quality expected. Moreover, they sometimes got off of the subject, used more time than was allocated for the presentation or struggled with the technology. Using visuals became a problem as well. Slideshow presentations created without contrasting colors and using small fonts made it difficult to see at the remote sites. Presenters who used overheads with small fonts ran into the same issues. In one case, the presenter stressed where she received her degree and talked well above the audience of elementary school teachers. All of this came even after meeting with each presenter prior to their presentation and going through the procedure with them, explaining the audience and the evaluation process. Hence, it is critical you know the presentation ability of your presenters well in advance and not recruit instructors by word-of-mouth only. Nevertheless, this was not surprising since the presenters were not paid for their efforts. They were recruited strictly on a volunteer basis. However, problems with the presenters were very limited as the majority of the presenters were well received by the participants and followed the structure precisely.

Asynchronous, Web-based Sessions

The asynchronous component is unique to the previous two modes because the teacher participants viewed the streamed video and corresponded with each other through a discussion board within the framework of the Blackboard® web portal used as *mygateway* at the University of Missouri-St. Louis at their own convenience. The streamed video, not unlike the videotape used in the videotaped sessions, were taken from a previous live presentation, streamed and uploaded on to the *mygateway* web site.

Streamed video was used rather than the customary text based method for reasons suggested through the literature on computer-mediated communication (CMC). Another widely studied aspect of the way students learn through interactive computer media is the use of social context clues; or lack there of. Social context clues include aspects of physical environment that define the nature of the social situation and the actors' relative status. Cues given to students such as encouraging gestures, smiles, and praise were social factors that enhanced both students' satisfaction and their perceptions of learning (Hackman, 1990). Sproull (Sproull, 1986)sees this as the critical difference between face-to-face communication and that of CMC. The absence of such clues in CMC leads to increased excited and uninhibited communication such as "Flaming" (insults, swearing, and hostile, intense language), greater self-absorption versus other-orientation and messages reflecting status equalization. The cause of this lack of social context clues could be the result of the limited bandwidth allocated to CMC groups. CMC partners may require more verbal message exchanges than will face-to-discontinuities are partly at the root of the widespread perception that the community of educational researchers has failed to amass a cumulative body of knowledge about how school and schooling work (Council, 1999). This provides real concerns that students appreciated the accessibility of their distance education courses even though their on-line courses contained far less dialogue than the conventional face-to-face classes (Sherry, 1996).

The use of video certainly enhances the visual learner's capacity to assimilate new content (Dunston, 1992; Hannafin, 1996) but what if there is a question that has been conjured by the illustration? This is where the need for interactivity in vital. In a report

that focused on distance education networks in Georgia, Missouri and California, Walsh & Reese (Walsh, 1995) suggest ways distance education can extend and improve the quality of a university's educational offerings, provide economic benefits, and offer a strategic advantage in piercing new markets. Furthermore the authors suggest that video is the key ingredient in all of the networks that work. "When combined with other media, video has proven to be a highly effective way of getting and holding students' attention, so real learning can take place." Hannafin (1996) embodies the theory of more is not necessarily better when presenting stimuli. The more stimuli presented, the more cognitively confused the learner becomes. When communication is one way, it is well documented that presenters of distance education use considerably more visual stimuli than do presenters in two-way and face-to-face instruction. In similar general relativity courses taught at the Arizona State and Boston University, students reported dissatisfaction with the difficulty in communicating the mathematical formulas in text.

Where to Begin

Planning an asynchronous session in the manner it was done in our project entailed much of the same methods as the live and videotape session. Digitizing the video and setting up the discussion board was the vital part in planning for a successful session. Using the Macintosh application *Imovie,* the videotape of the live presentation was imported into the program and edited to allow for the participants to view either the presentation only, or the entire session. Then uploaded to a designated site using *Blackboard*, the streamed video automatically played in the assigned window when the participants visited.

Bandwidth considerations, connection speed of the participants to the Internet, the participant's computer familiarity and storage capacity on the University server proved to be a challenge in developing the sessions as well.

Finally, in designing the asynchronous session, all of the participants must be entered into the Blackboard in advance of the desired time allocated for the presentation to be viewed and the discussion to occur. Participants need to know how to access the site and what to do once they get there. This may be viewed more as a roadblock but The Quarterly Review of Distance Education (Education, 2000) found that well designed research on effective strategies was lacking in the literature.

Possible Impediments

For obvious reasons, downloading a 30-minute presentation over a 28.8 mps connection would take hours not to mention losing information if the participant happened to get knocked off-line. However, high bandwidth also is limited to cost, availability of the technology in the geographic area of the learner, and reliability of the technology during peak usage hours. This also leads to costs and insufficient technical support for the audio-video equipment maintenance (Wong, 1989).

The issue of attendance is easily rectified through asynchronous communication using Blackboard's system. There is a "Tracking" option within the application that allows the facilitator of the site to track the amount of time each participant spends at a given sub-section of the site (Appendix B). For example, students may not even watch the video or they are accounted for spending 15-mintues on the video page when in fact the video was 30-minutes in length. The facilitator knows immediately that the participant hasn't completed the task correctly.

A common roadblock in all 3 areas was the notion of evaluation/assessment of sessions. In the digital age it is easy for a student, or in-service teacher in our case, to claim they sent an evaluation form although the evaluator hadn't received it. One can easily justify missing assignments as downed servers, improperly working email accounts or claims of misplacing it once downloaded by the evaluator.

Distance education is here and possibly here to stay. It is vitally important that there be a common delivery method that is cost effective to the university and student but more importantly operational so to provide a channel for meaningful learning to occur.

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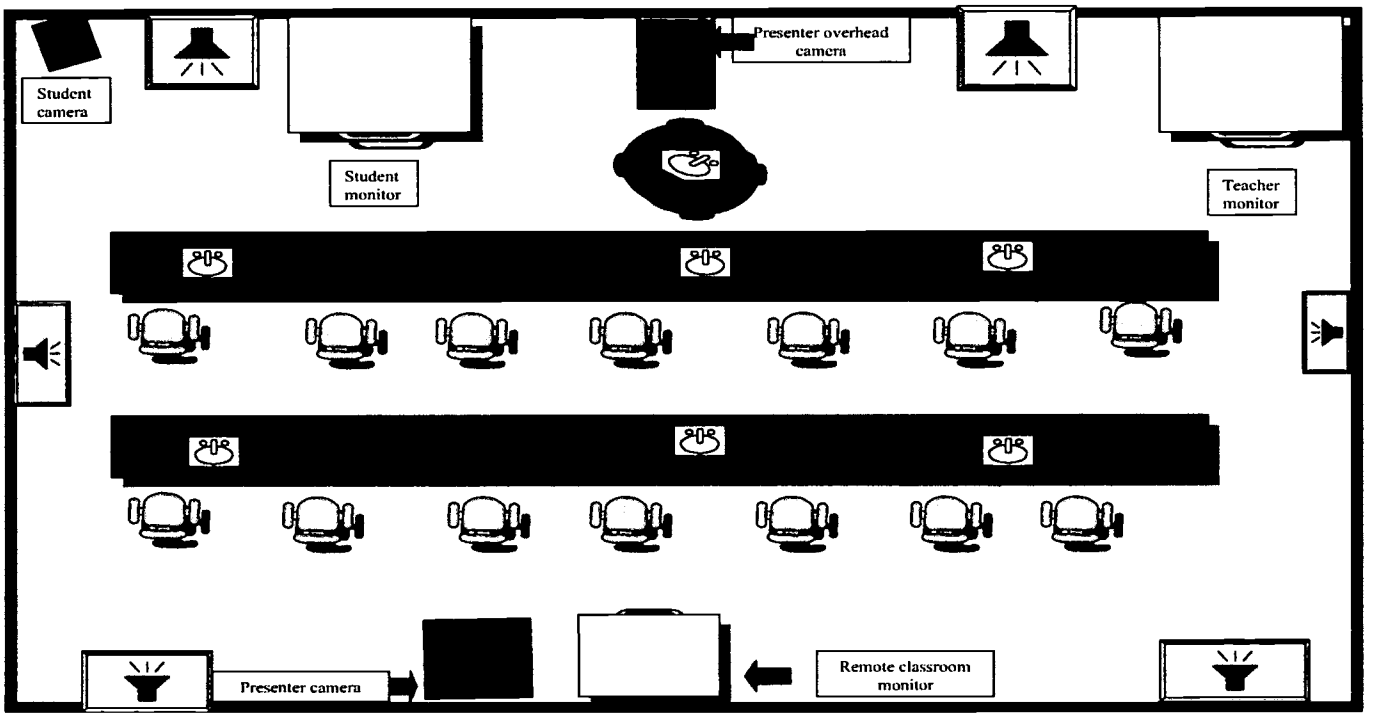
Appendices

Appendix A

Setting

Video Conference Room

Figure 1



Appendix B

▲ Top **Number of Accesses over Time**

Participants	2002-112	2002-113	2002-114	2002-115	2002-116	2002-117	2002-118	2002-119	2002-120	2
A	0	0	0	0	0	0	0	0	0	(
B	1	0	0	0	0	0	0	0	0	(
C	1	0	0	0	0	0	0	0	0	(
D	0	0	0	0	0	0	0	0	0	(
E	0	9	1	0	0	0	0	0	0	(
F	0	0	0	0	0	0	1	0	0	(
G	0	0	0	0	0	0	0	0	0	(
H	1	0	0	0	0	0	1	1	0	(
I	3	0	0	0	0	0	0	0	0	(
J	0	0	0	0	0	0	0	0	0	(
K	0	0	0	0	0	0	0	0	0	(
L	1	0	0	0	0	0	0	0	0	(
M	0	0	0	0	0	0	0	0	0	(
N	0	0	0	0	2	1	0	0	0	(
O	1	0	0	0	0	0	0	0	0	(
P	0	0	0	0	0	4	5	0	0	(
Q	2	0	0	0	0	0	0	0	1	(
R	2	0	0	0	0	0	0	0	0	(
S	0	0	1	0	0	0	0	0	0	(
T	2	1	0	1	0	0	0	0	0	(

U	0	0	0	0	0	0	0	0	(
V	0	0	0	0	0	0	0	0	(
W	0	0	0	0	2	0	0	0	(
X	0	0	2	0	0	0	0	0	(
Y	0	1	0	0	0	0	0	0	·
Z	0	0	7	0	0	0	0	0	(
AA	0	0	2	0	0	1	0	0	(
AB	0	0	0	4	0	0	1	0	0 ·
AC	1	0	0	0	0	0	0	0	(
AD	0	0	0	1	0	0	1	0	0 (
AE	3	2	0	0	0	0	0	0	(
AF	1	4	1	0	0	0	0	0	(
AG	2	0	0	0	1	0	0	0	(
AH	0	0	0	0	0	0	0	0	(
AI	0	3	0	0	0	0	0	0	(
AJ	0	0	3	0	0	0	0	0	·
AK	1	2	0	1	0	0	0	1	(
TOTAL	**22**	**22**	**17**	**7**	**5**	**6**	**9**	**1**	**2** :

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